Association for Information Systems
AIS Electronic Library (AISeL)

SIGHCI 2008 Proceedings

Special Interest Group on Human-Computer Interaction

2008

The Role of Website Service Functionality in Explaining Price Dispersion and Price Trade-offs in Online Markets

Sameh Al-Natour
University of British Columbia, sameh.alnatour@sauder.ubc.ca

Izak Benbasat
University of British Columbia, benbasat@sauder.ubc.ca

Ronald T. Cenfetelli
University of British Columbia, cenfetelli@sauder.ubc.ca

The Role of Website Service Functionality in Explaining Price Dispersion and Price Trade-offs in Online Markets

Sameh Al-Natour
University of British Columbia
sameh.alnatour@sauder.ubc.ca

Izak Benbasat
University of British Columbia
benbasat@sauder.ubc.ca

Ronald T. Cenfetelli
University of British Columbia
cenfetelli@sauder.ubc.ca

ABSTRACT

In this paper we report on two studies that (1) examine whether service quality and the set of functionality offered by a website can explain price dispersion in the online electronics market, and (2) investigate whether customers are willing to trade-off lower prices for more website functionality. The results highlight the importance of functionality offered by retailer websites in explaining the dispersion in observed prices, especially compared to service quality and market share. Study 2 demonstrates that customers attach different importance to product prices and have non-zero valuations for website functionality.

KEYWORDS

Online shopping, price dispersion, price premiums, website functionality, service quality.

INTRODUCTION

Since the proliferation of electronic commerce (e-commerce), the Internet has been hailed as an efficient medium that eliminates search costs, thus, making electronic markets more competitive (Bakos, 1997). As a result, when offering undifferentiated products, retailers are expected to offer similar prices, emulating those in near perfect competition. Yet, an abundance of studies have long recognized that price dispersions are rampant in online markets, even in the case of undifferentiated products (e.g., Clay, Krishnan, & Wolff, 2001; Clemons, Hann, & Hitt, 2002; Pan, Ratchford, & Shankar, 2002). Price dispersion is defined as "the distribution of prices of an item with the same measured characteristics across sellers" (Pan et al., 2002, p. 433), where standard deviation is typically used as a proxy. Brynjolfsson and Smith (2000) estimate this dispersion to be 33% for books and 25% for CDs.

When attempting to understand the persistence of price dispersion in what was previously thought of as a price efficient market, researchers have offered two main explanations. The first views price dispersion as an equilibrium outcome that is the byproduct of incomplete information (Pan et al., 2002). The second, on the other hand, accepts that search costs are negligible in online markets and proposes that price dispersion is a result of differences in the characteristics of online retailers, the markets they compete in, or the products and services they offer. This latter view has attained some research support. For instance, Clay et al. (2001) provided evidence that the degree of price dispersion is affected by the competitive structure as well as by advertising expenditure. Likewise, Clemons et al. (2002) showed that the characteristics of tickets offered could explain some of the price dispersion prevalent in the online travel market. Similarly, Pan et al. (2002) have shown an effect of retailer type on price.

Yet, in these studies and many others endorsing this perspective, differences in product, retailer, and market characteristics could account for only a relatively small percentage in price dispersion. Consequently, researchers have added additional variables to explain price dispersion, especially in the case of undifferentiated commodity products. For example, service was proposed as means for differentiating previously undifferentiated products, thus, allowing some retailers to charge a price premium.

Research in information systems (IS) has long recognized the ability of information technology (IT) to enhance, and thus differentiate, product offerings by providing customers means to achieving their shopping goals. Nault and Dexter (1995) found that the introduction of IT at gas stations increased control and convenience, thus, allowing retailers to charge price premiums. In e-commerce, the website features offered were shown to predict online retailers' performance (Saeed, Hwang, & Grover, 2002).

While indeed the results have shown that service quality differences explain some of the observed price dispersion, a large proportion of these remain unexplained (Pan et al., 2002). To fill in this gap, we believe, a detailed assessment of the ways in which IT can be leveraged to provide enhanced services to differentiate products is needed. That's why in this paper, we set out to explain the specific influences of IT on price dispersion by assessing the degree of service functionality that is provided by e-commerce websites. Service functionality is the extent to which a website uses IT to provide services that support a core product or service transaction, and to help customers reach their shopping goals (Cenfetelli, Benbasat, & Al-Natour, 2008). Functionality describes a variety of possible IT-enabled services. More specifically, in this paper, we investigate the impact of functionality on online prices through two studies that demonstrate the existence of price dispersion in the online electronic products

market, and that prices charged by retailers are explained by the level of service quality and IT-based tools offered. Subsequently, we present a study that examines customers' willingness to trade-off lower prices for more service functionality via asking them to assign importance scores to prices relative to functionality items that were identified in study 1.

STUDY 1: SERVICE QUALITY AND FUNCTIONALITY AS PREDICTORS OF PRICE DISPERSION

In e-commerce, service quality has been defined as "the extent to which a website facilitates efficient and effective shopping, purchasing, and delivery of products and services" (Zeithaml, Parasuraman, & Malhotra, 2002, p. 363). Consistent with the most applied service quality framework, SERVQUAL, the construct of website service quality includes the five dimensions of reliability, assurance, empathy, responsiveness, and tangibles (Devaraj, Fan, & Kohli, 2002). In addition to acting as an antecedent to evaluative beliefs such as satisfaction and perceived usefulness (Cenfetelli et al., 2008; Devaraj, Fan, & Kohli, 2002), this construct has been used to predict price dispersion (Pan et al., 2002), and proposed to be a more important determinant of satisfaction with a shopping experience than price (Zeithaml et al., 2002).

H1: Service quality positively affects observed price.

Based on models such as the supplementary service (Lovelock, 1994) and the Customer Service Life Cycle (CSLC) models (Ives & Learmonth, 1984), which highlight the importance of offering additional value-adding services beyond the product itself, a number of researchers have proposed new constructs that capture the type of services online retailers offer to their customers through the website interface. For example, Piccoli et al. (2004) investigated the general customer needs that can be met through the provision of online supporting services. More recently, Cenfetelli et al. (2008) have introduced the construct of supporting services functionality (SSF), which refers to the use of IT to deliver services that support a core product or service, and further distinguished its effects from those exerted by service quality. Their results demonstrate that while both constructs act as significant predictors of satisfaction, SSF, and due to its more direct role in creating value for customers, has a stronger effect on usefulness.

On the other hand, while Cenfetelli et al. (2008) have chosen to represent the construct of SSF and its antecedent dimensions as perceived measures of the extent to which the website helps customers achieve certain goals, it has been recognized that service functionality can also be specified at a more atomic level. Rather than measuring customers perceptions of the extent to which the website tools in general help accomplish goals associated with specific stages of the customer service lifecycle, it has been argued that service functionality can be defined as an index measuring the extent to which a website offers specific tools that help customers throughout the different lifecycle stages (Cenfetelli & Benbasat, 2002). In this study, we adopt this latter view of service functionality, as we view it to be more directly related to the design of the website interface itself, thus, strengthening the ability of our results to inform website design. Consequently, we define service functionality as an index measuring the extent to which a website offers a number of tools that are considered important by customers. Similar to Saeed et al. (2002) and others who have adopted this basic view of service functionality, we propose that providing tools that enhance the execution of transactions creates value for customers, thus, allowing companies to charge price premiums.

H2: Service functionality positively affects observed price.

Following Cenfetelli et al. (2008) who have demonstrated that service quality and SSF have positive effects on satisfaction, we further hypothesize that service quality and service functionality have positive effects on customers' overall satisfaction with a website. It is important to note that unlike Cenfetelli et al. (2008), our measure of service functionality captures the whether a website offers specific IT-enabled tools deemed important by customers.

H3: Service quality positively affects satisfaction.

H4: Service functionality positively affects satisfaction.

Method

In order to test for the effects of specific functionality items on the ability to charge price premiums, it was necessary to develop a parsimonious list of functionality items that customers consider important. To accomplish this, we completed the following four tasks:

- Ten graduate business students were invited to assist in generating service functions that can be deployed through websites. They were encouraged to think of all possible functions that can be offered to help at the various stages of the customer service lifecycle. After culling redundant ones, 56 functions were generated.
- We looked for examples of service functions in the literature. This review generated an additional 43 functions not identified in the first study for a consolidated set of 99 functions.
- We chose 21 established online websites across an array of retail categories (e.g. travel, clothing, and electronics). Two judges to content analyze each websites to identify the service functions made possible through IT, again using the service dimensions as a priming mechanism. This exercise identified 147 functions. We compared these functions with those

previously identified and eliminated 33 redundant functions.

- To reduce the list of 206 functionality design attributes to a manageable list of those that are of most importance to e-commerce users as well as being relevant across a wide array of possible product types, we conducted a fourth exercise in which we recruited a panel of 60 e-commerce consumers to act as judges to evaluate these 206 functions and assign absolute importance levels to each, as well as identify whether each function applies to any of 5 categories (Books; Clothing; Electronics; Music / Video / DVD / Games; or Other). To prevent participant fatigue, the items were split into three groups, where each item was evaluated by 20 judges. For a function to be retained, it had to have a value of at least 4.00 (out of a maximum 5.00) for the average judged importance *and* been deemed as relevant by more than half the judges for at least three of the five product categories.

After completing the four exercises described above, we were left with 60 distinct service functions (see Appendix A in the online supplement available at: http://isr.sauder.ubc.ca/HCI/HCI08-29-Supplement.pdf). These functions, together with established instruments measuring website service quality (Devaraj et al., 2002) and satisfaction (measured using a four-item semantic scale adapted from Bhattacherjee, 2001) were used in a large-scale survey. Subjects were asked to evaluate a website they are familiar with in regards to the extent to which it offeres these functions (7-point Likert agreement scale), in terms of the five SERVQUAL dimensions, as well as their overall satisfaction with the website. In this field study, email invitations were sent to 4,100 members of a market research firm's panel. Individuals were provided a point-based incentive for their assistance in the study redeemable for various prizes made available through the marketing firm. The final sample included 1081 subjects who reported on 292 websites across the five product categories.

To test for hypotheses 1 and 2, it was necessary to develop a set of price observations. Unlike much of the prior research, we chose to adopt a website level of analysis, rather than analyzing a distinct set of price observations. This was especially important in this study since subjects were asked to evaluate a familiar website in the context of shopping for a product category rather than a specific product. As such, we decided to create a price index for each identified website in a product category. This website level of analysis in the context of product category ensures that we can account for differences in the applicability of different functionality items in each product category. As a starting point, and given space limitations, we choose to concentrate our analysis to electronics as the product category of choice. This was mainly due to the fact that such products are undifferentiated and product information is easily accessible, thus, controlling for the effects of product heterogeneity and information asymmetry, whilst their relatively high prices ensure that customers have sufficient motivation to expend the needed search costs. Furthermore, in earlier stages of this study, it was observed that the electronics category enjoyed the most applicability and importance of the identified 60 functionality items.

Of the 1081, 80 subjects reported on a set of 17 distinct websites that offered popular products (another 30 subjects reported on electronics websites that offered niche products). Because subjects have purchased many different products from these websites, we chose to create a price index for each website by collecting data on the prices of four bestselling items (shown in Table 1). The focus on bestselling items was judged to be a more conservative approach since these items typically enjoy the least price dispersion across retailers. The analyzed websites offered a minimum of two of the chosen products, with a majority offering all four products. Price were then standardized for each chosen item (to account for differences in magnitude across items), and subsequently averaged to produce a price index for each examined website. A website not offering any of the four items was not penalized, and the price index was calculated using only available items.

Results

Appendix A provides a list of the 60 functionality items. Table 1 provides summary statistics of the product prices collected, which indicates the presence of price dispersion, even in this market of highly undifferentiated products.

	Range	Mean	Std. Dev.
Apple iPod 20 GB	$249.99-$299.99	$286.04	17.95
SanDisk 512MB Memory Stick Pro	$56.99-$84.99	$66.59	9.60
SanDisk 512MB Ultra II Secure	$49.99-$98.84	$64.59	12.28
Canon PowerShot A95 5MP Camera	$243.00-$329.99	$280.38	21.50

Table 1: Summary Statistics for Product Prices

To test for the four hypotheses put forth, a structural model was specified in Partial Least Squares (PLS-Graph version 3.00; Chin, 2001) in which the average score of functionality items and the average score of service quality dimensions (items within each dimensions were first average to obtain a score for each dimension) were used to predict price indices as well as customer overall satisfaction. Item scores were averaged for each website on occasions when multiple subjects reported on the same website. The choice of using averaged scores for both exogenous variables was justified by: 1) the established

importance of all SERVQUAL dimensions (the results of reliability and confirmatory factor analyses showed that SERVQUAL and Satisfaction are reliable and valid), 2) the fact that only functionality items that were identified to be important were included in the field test, and 3) our desire to minimize the number of indicators for each latent variable given the small sample size. Finally, we used the frequency at which a particular website was reported on as a pseudo measure of market share considering that our original sample of 1081 is representative of online shoppers in general. This measure was used as a control for observed price since controlling for market share reduces the observed price dispersion (Brynjolfsson & Smith, 2000).

After a bootstrapping procedure with 200 subsamples, the model results revealed that market share has a positive effect on observed price ($\beta = 0.15$, $p < 0.01$). Contrary to hypothesis 1, the effect of service quality on observed price was negative and statistically significant ($\beta = -0.34$, $p < 0.01$). On the other hand, consistent with hypothesis 2, service functionality had a large positive effect on observed price ($\beta = 0.71$, $p < 0.01$), where together with service quality, it explained 31% of the variance in that variable. Removing market share as a control variable reduced the total variance explained to 29%, and the effects of service functionality and service quality were changed to $\beta = 0.76$ and $\beta = -0.36$, respectively. Consistent with Cenfetelli et al. (2008), the effects of service quality and service functionality on customer satisfaction were positive and statistically significant ($\beta = 0.60$, $p < 0.01$; $\beta = 0.35$, $p < 0.01$, respectively), and together they explained 80% of the variance in satisfaction. In summary, while hypotheses 2-4 were fully supported, the results suggest a negative effect of service quality on observed price (Appendix B of the online supplement depicts the structural model).

Discussion of Study 1 Results

The results of study 1 highlight the importance of service functionality as an explanatory factor of price dispersion in online markets. Furthermore, consistent with Cenfetelli et al. (2008), we find that the effects of service quality are most potent when predicting evaluative attitudes such as satisfaction, and further find that when compared to service quality, service functionality is more predictive of price premiums. This indicates that service functionality rather than service quality is more likely to create additional value for customers, and thus, enable companies to charge prices premiums. The negative effect of service quality indicates that, when holding service functionality constant, service quality negatively impacts observed prices. It is important to note that the bivariate correlation between service quality and observed price is positive and statistically significant ($r = 0.19$, $p < 0.05$), indicating that only in the presence of other variables does this effect become negative. A negative effect of service quality on profits has been previously observed (Easton & Jarrell, 1998).

STUDY 2

Study 1 provided evidence that differences in website service functionality, not only can explain some of the variance in customer satisfaction, but also further adequately explain some of the dispersion in observed prices of undifferentiated products. Nonetheless, in providing descriptive explanations for online retailers' behavior of charging price premiums and discounts, study 1 could not provide any insights into whether customers are in fact willing to trade-off prices for better service functionality. Study 2 accomplishes exactly that. Specifically, in light of arguments in support of customers' willingness to trade-off price for supplementary services (Zeithaml et al., 2002), and consistent with views of service functionality as value-adding (e.g., Lovelock, 1994) that when offered can affect customers' valuation of products and reduce the relative effect of price as a determinant factor (Pan et al., 2002), we make the general hypothesis that customers will assign non-zero evaluations to service functionality items relative to those assigned to price.

H5: Customers have non-zero valuations of service functionality relative to their price valuations.

Method

To test for hypothesis 5, we designed an experiment in which subjects were asked to assign importance levels to a subset of functionality items as well as price. Specifically, subjects were asked to imagine a scenario in which they were shopping for a laptop computer online, and were asked to divide a total of hundred points (representing importance) between price and a subset of 8 functionality items (subjects were treated with manageable subsets of 8 items to facilitate the administering of stage 2 of the experiment). Eight conditions were created and each of the 60 functionality items were randomly assigned to one of these treatment groups. To enable a cross-treatment group analysis, we chose four functionality items, including each in two treatment groups. In other words, treatment groups 1 and 2 shared one functionality item, while treatment groups 3 and 4 shared another … etc.[1] One-hundred and five

[1] A second stage of study 2 involved asking subjects to choose from among a number of stores offering different types of functionality and different prices. Subjects were asked to rank-order 8 fictional stores from least preferred to most preferred. These stores offered the exact same laptop computer at varying prices (in intervals of $10), and differed in whether they offered the 8 functionality items in each treatment group. More details about this and the results will be presented at the workshop.

subjects were randomly assigned to one of the eight treatment conditions and provided incentives as in study 1.

Results

To test for hypothesis 5, we computed a ratio of the assigned importance of each functionality item relative to price (i.e., relative importance to price = importance of functionality x / importance of price)[2]. Appendix A shows the computed relative functionality-price importance ratios for each of the 60 functionality items. These results indicate the dominance of service functionality items that deal with security issues when compared to price. To ensure that the random assignment to treatment groups was successful, we compared the scores of the repeating functionality items. The item shared between the 1st and 2nd treatment groups had a similar distribution of the ratio of their importance relative to price importance (difference in means of ratios test $p = 0.35$). Similar results were observed for those functionality items shared between groups 3 and 4, 5 and 6, and 7 and 8 ($p = 0.577$; $p = 0.15$; $p = 0.96$; respectively).

Next, we performed a series of one-sample T tests to examine whether the relative importance of each functionality item is different from zero. Significance values (p-values) are shown for each functionality item in Appendix A. the results revealed that 46 out of the 60 functionality items had non-zero relative price valuations ($p < 0.05$), thus, lending partial support for hypothesis 5.

Discussion of Study 2 Results

The results of study 2 indicate that not only do customers attach importance to different functionality items, but also that valuations of service functionality relative to those of price are mostly non-zero. This indicates that customers are willing to trade-off price for more functionality. Results also highlight that not only do customers differ in their valuation of each functionality item and across items, but also valuations of these items relative to price are equally dispersed. This further reaffirms the importance of personalization mechanisms that allow websites to offer the most valued tools to each customer.

CONCLUDING REMARKS:

The two studies described above were able to answer two important questions. First, the results of study 1 empirically validated the ability of service functionality to explain some of the observed price dispersion in online markets. The strength of the effect of service functionality relative to that of service quality in predicating observed prices, but its relative weakness when used as a predictor of satisfaction lends further support to the proposition that these two constructs are not only distinct, but also perform distinct roles. The results from study 2 provided support for the notion that customers are in fact willing to trade-off prices for more functionality. Nonetheless, these results also indicate that valuations of service functionality items differ largely, and their provision does not necessary reduce the effect of price as a determinant factor.

[2] The 4 subjects providing zero valuation for price were excluded.

REFERENCES

1. Bakos, Y. (1997). "Reducing Buyer Search Costs: Implications for Electronic Marketplaces," *Management Science*, Vol. 43, No. 12, 1676-1692.
2. Bhattacherjee, A. (2001). "Understanding Information Systems Continuance: An Expectation-Confirmation Model," *MIS Quarterly*, Vol. 25, No. 3, 351-370.
3. Brynjolfsson, E. and Smith, M. (2000). "Frictionless Commerce? A Comparison of Internet and Conventional Retailers." *Management Science*, Vol. 46, No. 4, 563-585.
4. Cenfetelli, R., Benbasat, I., and Al-Natour, S. (2008). "Addressing the What and How of Online Services: Positioning Supporting-Services Functionality and Service Quality for Business-to-Consumer Success." *Information Systems Research*, Vol. 19, No. 2, 161-81.
5. Cenfetelli, R.T. and Benbasat, I. (2002). "Measuring the E-commerce Customer Service Life Cycle." *Proceedings of the 10th European Conference on Information Systems*, Gdansk, Poland, 696-705.
6. Chin, W.W. (2001). *PLS-Graph (3.0) Manual*, 1-18.
7. Clay, K, Krishnan, R., and Wolff, E. (2001). "Prices and Price Dispersion on the Web: Evidence from the Online Book Industry." *The Journal of Industrial Economics*, Vol. 49, No. 4, 521-539.
8. Clemons, E., Hann, I., and Hitt, L. (2002). "Price Dispersion and Differentiation in Online Travel: An Empirical Investigation." *Management Science*, Vol. 48, No. 4, 534-549.
9. Devaraj, S., Fan, M., and Kohli, R. (2002). "Antecedents of B2C channel satisfaction and preference: Validating e-commerce metrics." *Information Systems Research*, Vol. 13, No. 3, 316-333.
10. Easton, G. and Jarrell, S. (1998). "The Effects of Total Quality Management on Corporate Performance." *Journal of Business*, Vol. 71 (April), 253-308.
11. Ives, B., Learmonth, G. (1084). "The information system as a competitive weapon." *Communications of the ACM*, Vol. 27, No. 12, 1193-1201.

12. Lovelock, C.H. (1994). *Product Plus: How Product + Service = Competitive Advantage*, McGraw Hill, NY.
13. Nault, B. and Dexter, A. (1995). "Added Value and Pricing With Information Technology." *MIS Quarterly*, Vol. 19, No. 4, 449-464.
14. Pan, X., Ratchford, B., and Shankar, V. (2002). "Can Price Dispersion in Online Markets Be Explained by Differences in E-TailerSer vice Quality?" *Journal of the Academy of Marketing Science*, Vol. 30, No. 4, 433-445.
15. Piccoli, G., Brohman, M.K., Watson, R.T., and Parasuraman, A. (2004). "Net-Based Customer Service Systems: Evolution and Revolution in Web Site Functionalities." *Decision Sciences*, Vol. 35, No. 3, 423-455.
16. Saeed, K., Hwang, Y, and Grover, V. (2002). "Investigating the Impact of Web Site Value and Advertising on Finn Performance in Electronic commerce." *International Journal of Electronic Commerce*, Vol. 7, No. 2, 119-141.
17. Zeithaml, V.A., Parasuraman, A., and Malhotra, A. (2002). "Service quality delivery through Web sites: A critical review of extant knowledge." *Journal of the Academy of Marketing Science*, Vol. 30, No. 4, 362-75.